HYDRODEC NORTH AMERICA, LLC
DEMONSTRATION TEST PLAN

MAY 5, 2009

DEMONSTRATION TEST PLAN

PCB DISPOSAL BY NON-THERMAL ALTERNATIVE METHODS
Hydrodec North America LLC
2021 Steinway Boulevard
Canton, Ohio 44707

Proposed Test Dates: September 15 through September 18, 2009
Submission Date: 5/5/2009
Submission Number: 001 (one)

Submitted by:

Hydrodec North America, LLC
2021 Steinway Boulevard
Canton, Ohio 44721

Submitted to:

Matt Hale - Director
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Potomac Yards North
2733 S. Crystal Drive
Rm # N-6331
Arlington, VA 22202

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APPENDICES

SECTION 1 – SUMMARY

Hydrodec North America, LLC has designed a process that effectively treats transformer oils contaminated with polychlorinated biphenyls (PCBs). Hydrodec uses a hydrogenation process that chemically removes the chlorines from the PCB's rendering them harmless. The system is automated and consists of bulk shipment unloading, PCB storage tanks, a feedstock tank, heaters, reactors, heat exchangers, oil water and gas separation, and a recycle gas recovery system. Hydrodec currently operates a similar facility in Young, Australia. The Young facility has demonstrated the process effectively destroys PCB's without hazardous emissions or bi-products. A summary of test results are provided in Appendix A.

Hydrodec intends to use their technology at their facility located in Canton, Ohio as well as a proposed facility located in Laurel, Mississippi.

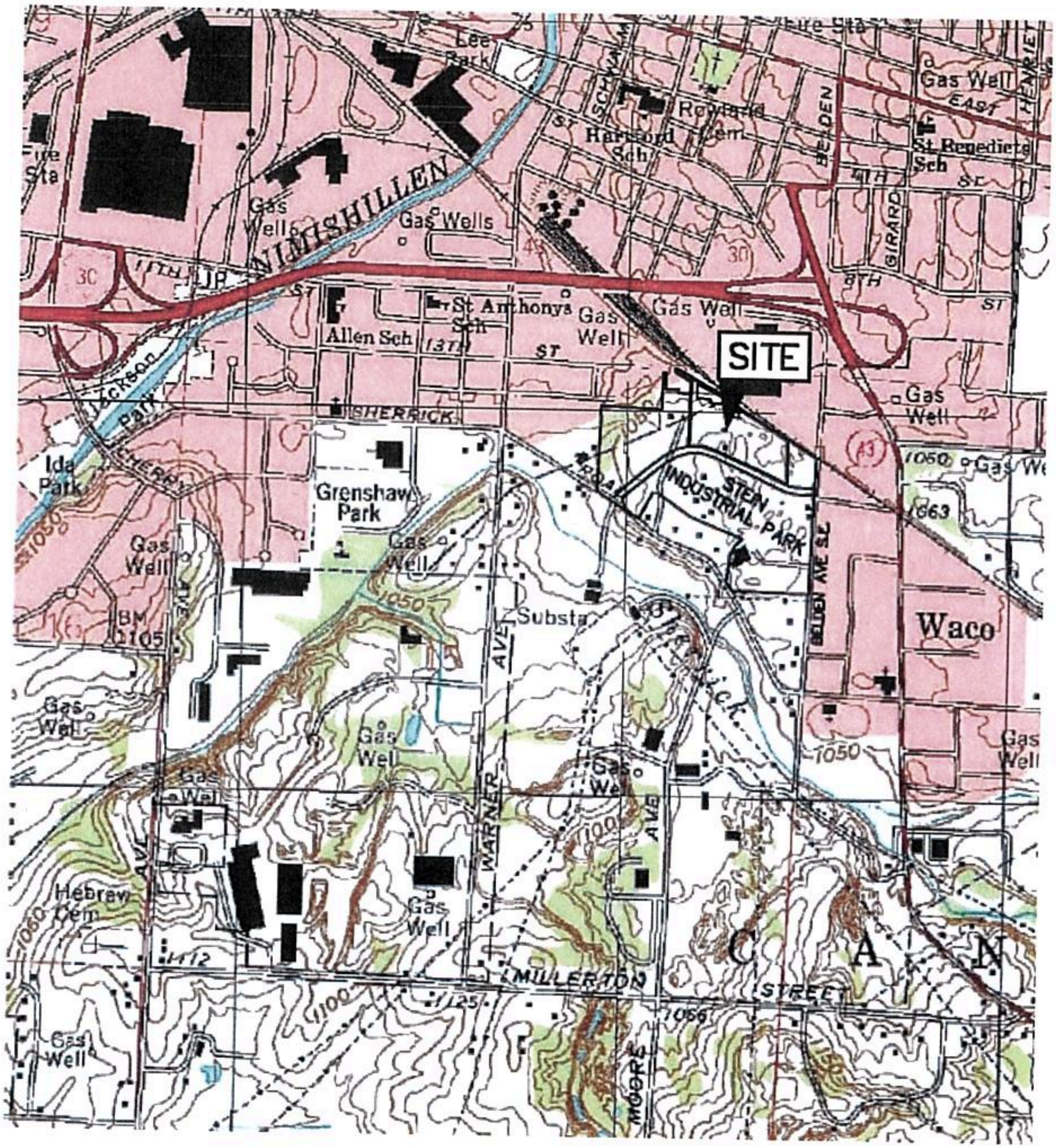
The demonstration test will be conducted by Hydrodec at the Canton, Ohio facility (See Figures 1 and 2). The proposed dates for the demonstration test are September 15-18, 2009.

Address:

Hydrodec North America, LLC
2021 Steinway Boulevard
Canton, Ohio 44721

FIGURE 1
USGS Map
(Canton East Quadrangle)

Site:	Hydrodec, 8.4 Acres Canton, Ohio	**Scale:**	None



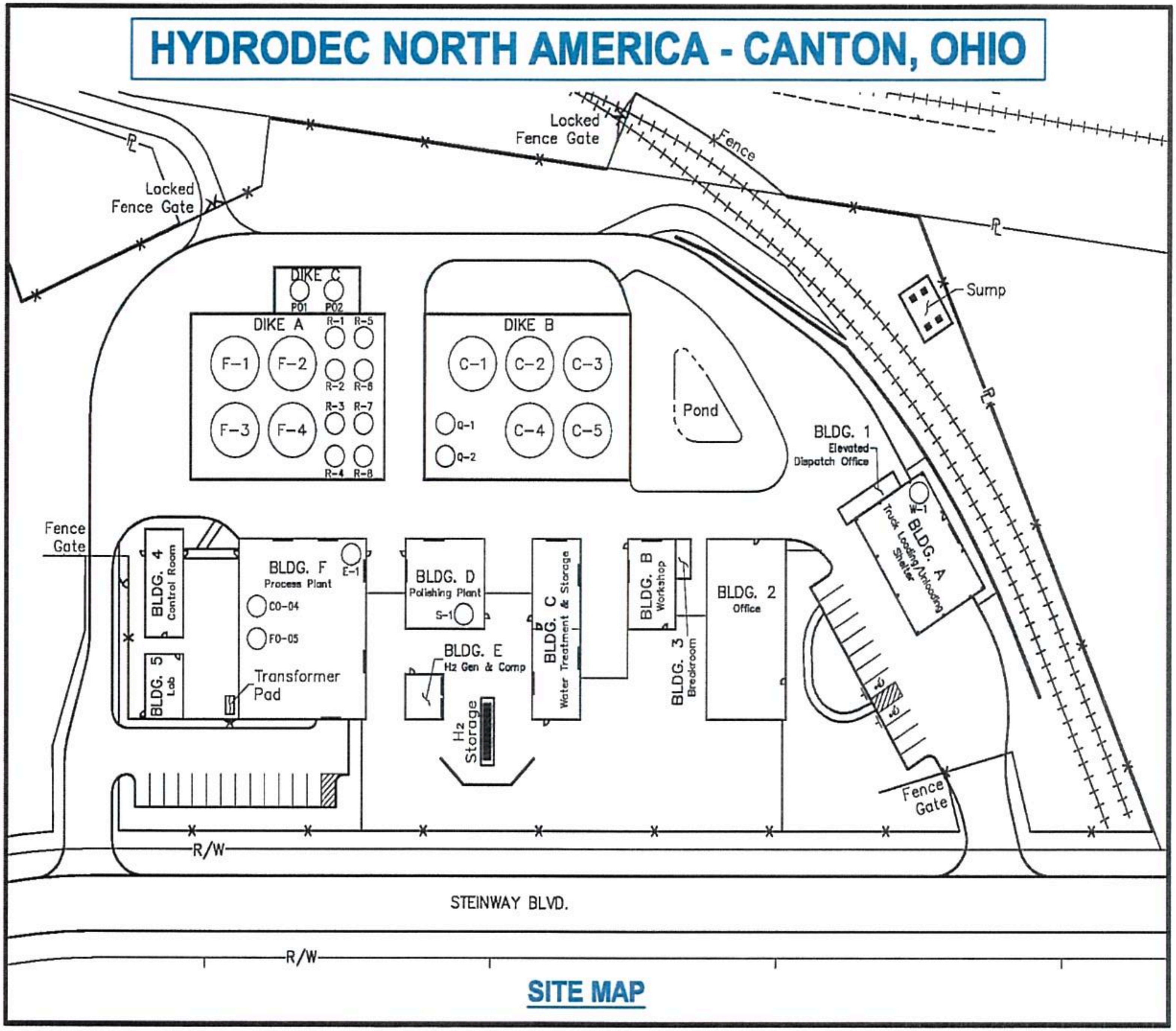


Figure 2 - Site Map

SECTION 2 – PROJECT ORGANIZATION

Brian Davies of Hydrodec will have overall authority and responsibility for conducting the demonstration test. Hydrodec operations personnel will conduct all process related activities. Test America has been selected as the off-site laboratory for conducting the analysis for the demonstration test. The following provides a list of key personnel for the test and Figure 2-1 presents an organization chart of demonstration test personnel.

RESPONSIBILITY	NAME
Project Director	Mark McNamara.
Operations Director	Brian Davies
Process Engineer	Warren Aiken
Operations Coordinator	Christopher Alberts
Demonstration Test Coordinator	Brian Klink
Maintenance Coordinator	John Merrin
Quality Assurance Officer	Joe DeVirgilio
Safety Officer	Joe DeVirgilio
Laboratory Personnel	Hydrodec and Test America
Monitoring Systems Operator	Christopher Alberts
Sampling Crew Chief	Test America - Will Cordell

The following provides a brief description of the qualifications of the identified key personnel:

Mark McNamara (CEO) – Mr. McNamara is an Industrial Chemist with 20 years of experience in the management and execution of environmental and hazardous waste projects.

Brian Davies – Mr. Davies has 30 years operations experience with ICI plc, ICI Australia, Western Mining and Newcrest with a substantial period of this time spent operating and maintaining complex petrochemical operations with many similarities to the Hydrodec process. He is the General Manager of Hydrodec Operations.

Warren Aiken - Mr. Aiken is the Young facility Process Engineer and has been with Hydrodec for over 4-years.

Christopher Alberts - Mr. Alberts has been involve in chemical processing for over 7 years. He has worked as a chemical plant operator as well as a supervisor.

Brian Klink: Mr. Klink has a degree in Environmental Resource Management and has been working in the environmental and safety field for over 20 years.

John Merrin: Mr. Merrin is a maintenance coordinator who has been involved in water and wastewater treatment for 18 years. He has been involved in mechanical as well as maintenance activities throughout this period.

Joseph DeVirgilio: Mr. DeVirgilio has a degree in safety sciences and has been working in the safety related field for over four years.

Hydrodec North America
Demonstration Test Organizational Chart
(May 5, 2009)

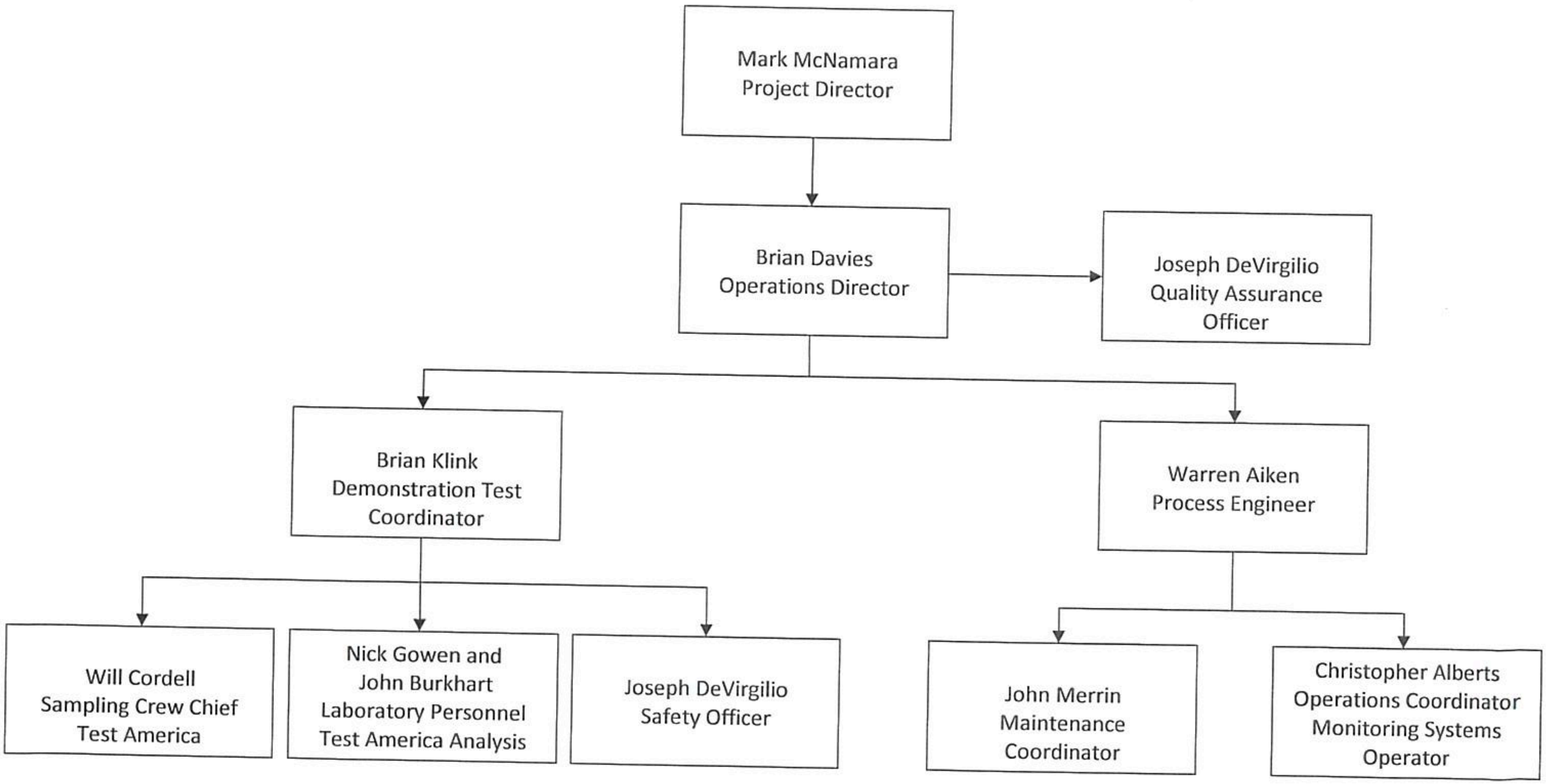


FIGURE 3

SECTION 3 – PROCESS ENGINEERING DESCRIPTION

3.1 General Description

The Hydrodec technology was developed specifically for the purpose of refining used oils and organic chemicals. It is as near to a closed loop zero emission process for the complete treatment of PCBs as is available in the world at this point in time. The Canton facility consists of four identical reactor trains. The following provides a description of the Hydrodec process as it flows through one of these trains. Figure 3-1 provides a Process Flow diagram while Figure 3-2 provides a detail of equipment.

3.2 Hydrogenation

The PCB contaminated transformer oil requiring destruction is collected in feedstock tanks which feed an oil surge tank. From the feed oil surge tank it is introduced to the process at a defined pressure. The oil is pre-heated by passing it counter-current to a hot hydrogenation reactor effluent stream and through a heat exchanger. Fresh and recycled hydrogen, together with the scavenger, are then introduced.

The combined flow is heated to reaction temperature in a continuous direct contact finned electrical heater then enters the hydrogenation reactor at defined temperature and pressure. The reactor comprises a single packed bed of a conventional hydro-treating catalyst.

During reaction, nitrogen or sulfur, also present as heteroatoms in the mineral oil, are largely converted to ammonia and hydrogen sulfide. Aged oil oxidation products present in the feed oil are also hydrogenated with the oxygen being removed as water.

In addition to extraction of heteroatoms and hydrodechlorination of PCB compounds, and depending on the carrier oil composition, a small quantity of hydrogen can be consumed in hydrogenating, to a small degree, the oil itself. This results in the possible generation of some saturated light hydrocarbon vapors and liquids in the boiling range below that of the parent oil and these are subsequently separated out within the hydrotreating system.

3.3 Reactor Effluent

Product oil leaving the Reactor (reactor bottoms) passes first to a Heat Exchanger where it is cooled against incoming feed oil.

Product oil leaving Heat Exchanger passes to a let-down valve where the pressure is reduced ahead of a Low Pressure Separator. Overhead vapors from this separator contain dissolved non-condensable hydrocarbons along with trace H_2S. The vapors pass to a Low Pressure Caustic Scrubber for trace residual hydrocarbon condensation and H_2S removal prior to venting to a catalytic oxidizer.

Once the oil exits the Low Pressure Separator, sufficient de-mineralized wash water is introduced to ensure that a liquid phase is present to dissolve and wash out the Scavenger Salt system while minimizing the quantity of aqueous effluent to be discharged from the plant. The washed oil product is then passed to a phase separator after which the final oil product is recovered. The aqueous phase containing the Scavenger Salt system is passed to a Waste Water surge drum prior to off-site shipment.

3.4 Reactor Gases

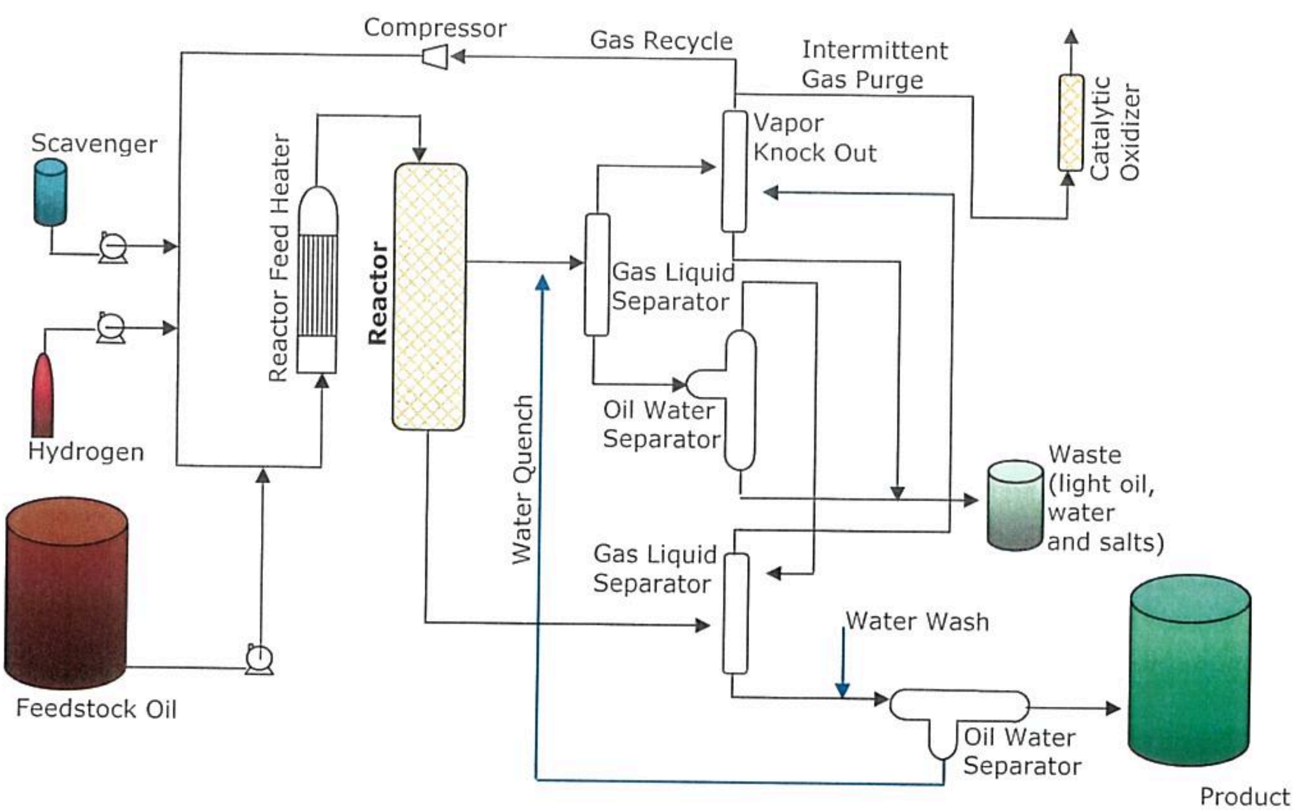
Reactor gases contain primarily excess hydrogen and are recycled back to the reactor feed. As they exit the reactor, gases are water quenched and passed to a High Pressure Separator. Vapor from the High Pressure Separator passes to a High Pressure Vent Condenser where it is cooled. Condensate, which is mainly water and small quantities of condensable hydrocarbons, is combined with the reactor bottoms before final wash water injection and product oil recovery.

Non-condensable gases from the High Pressure Separator comprise mainly hydrogen, but also contain light hydrocarbons and some H_2S. These are passed to a High Pressure Caustic Scrubber where H_2S is removed and collected into the caustic solution. Scrubbed gases are then chilled in a vertically mounted chiller, partially re-heated, passed through a sub-micron coalescer then recompressed for recirculation.

Build up of non-condensable hydrocarbon gases (methane, ethane) carried in the recycle gases are removed from the system through a slow bleed of purge gas flow from the gas recycle line prior to the compressor, then topping up the recycle line with fresh hydrogen. Purge gases are passed to the Catalytic Oxidation Unit for oxidation after which the product gases are released to the atmosphere.

Figure 3-1

Process Flow Diagram



Classification	Part Name	Form - Construction	Material	Note
Tanks	PCB Tank P-001	Capacity 8,200 gallons Nominal Diameter – 10' Nominal Height – 14'	Shell 1 – ¼ A-36 Shell 2 – ¼ A-36	Specific Gravity – 1
	PCB Tank P-002	Capacity 8,200 gallons Nominal Diameter – 10' Nominal Height – 14'	Shell 1 – ¼ A-36 Shell 2 – ¼ A-36	Specific Gravity – 1
Pumps	UV PS 1			
	UV PS 2			
Tank	Feedstock Tank F3	Capacity 100,000 gallons Nominal Diameter – 28' Nominal Height – 24'	Shell 1 – $^{3}/_{16}$ A-36 Shell 2 – $^{3}/_{16}$ A-36 Shell 3 – $^{3}/_{16}$ A-36	Specific Gravity – 1
Pump	Feed Pump PU-T3			
Reactor Feed Heater	HT-001	37"x37"OD x 184"L Capacity – 78 gallons	SA-106B	Internal 653 PSIG @ 662°F
Reactor	RA-001-A	37"x37"OD x 176" L Capacity – 223 gallons	SA-335P11	Internal 653 PSIG @ 662°F
Gas/Liquid Separator	VE-002	23"x25"OD x 95"L Capacity – 36 gallons	SA-106B	Internal 624 PSIG @ 392°F
Vapor Knockout	VE-004	20"x20"OD x 65"L Capacity – 10 gallons	SA-106B	Internal 653 PSIG @ 212°F
Catalytic Oxidizer	RA-003-A	26"x26"OD x 125"L Capacity – 79 gallons	Shell 1&2 – SA-240-30815	Internal 3 PSIG @ 1472°F
Oil/Water Separator	VE-003	33"OD x 85"Hx125"L Capacity – 185 gallons	Shell 1&2 – SA-106B	Internal 100 PSIG @ 212°F
Waste	VE-006	52"OD x 54"Hx75"L Capacity – 401 gallons	SA-240-316L	Internal ATM @ 158°F
Gas/Liquid Separator	VE-005	62"x62"OD x 161"L Capacity – 924 gallons	SA-516-70	Internal 80 PSIG @ 302°F
Oil/Water Separator	SE-001	114" DIA x 45"H Capacity – 1767 gallons	SA-240-304L	Internal ATM PSIG @ 122°F
Product	VE-010	52"OD x 54"Hx70"L Capacity – 401 gallons	SA-240-316L	Internal ATM PSIG @ 122°F

Figure 3-2 Equipment Specifications

3.5 Process Performance

The process described above is currently being run at the Hydrodec facility located in Young, Australia. The Young facility reactor is identical in size and flow through as each reactor currently being operated in the Canton facility. PCB's have been processed at the Young facility for a period of just under 5-years. The Young facility is licensed/approved to process PCB contaminated transformer oil at levels up to 5,000 ppm.

Re-refining PCB contaminated transformer oil on a continuous process basis has yielded complete removal of PCB within the limits of detection using NATA certified laboratory analysis and with >99% recovery of the oil as re-refined transformer oils within the limits of accuracy of normal process mass balance measures. Results of the typical refining process relative to ASTM Standard D 3487 for transformer oils are as follows.

Property	Units	Hydrodec Product Oil	ASTM D 3487
Corrosive Sulfur		non-corrosive	non corrosive
Specific gravity @ 15C	kg/l	0.8802	
Density @ 15C	kg/l	0.87	≤ 0.91
Viscosity @ 40C	centistokes	9.5-12	≤12
Viscosity @ 100C	centistokes	2.754	≤3
Flash Point	deg C	145.5	≥ 145
Breakdown voltage	kV	85.9	≥30
Dielectric Dissipation Factor (DDF) @ 90C	%	0.121	≤ 0.5
Resistivity	Gohm.m	222.6	
Moisture content	mg/kg	12	<35
Appearance		Clear & bright	Clear & bright
Color		L0.5	0.5
Acidity	mgKOH/g	<0.03	
Interfacial tension (IFT)	mN/m	51.8	>40
Oxidation stability		Pass	195
Analine point	deg C	81	63-84
PCB	mg/kg	Non-detectable	Non-detectable

1. Analysis performed by ALS Laboratories, Oil check Laboratories, Transcare Laboratories

3.6 Emissions and By-Products

There are three exit points for materials from the process. These are the product oil, the wastewater and the oxidizer emission. In relative proportion the mass flow from each of these points is as follows

Product Oil - 92.5%

Wastewater - 7.1%

Oxidizer Emission - 0.4%

The product oil has been shown non-detectable for all organochlorine chemicals.

3.6.1 Waste Water

Waste water is derived from the final oil wash and the water quench of the recycle gas. It has been shown free of chlorinated organic chemical but contains the scavenger salt system and trace product oil.

3.6.2 Oxidizer Emission

The oxidizer emission is more difficult to chemically characterize due to its very low mass and volume flow; the sensitivity of analysis required; and potential for background interference.

To understand the oxidizer emission it is quite important to understand its origin within the process. Hydrodec believes overall the process is as close as possible to a closed loop continuous reaction system as is currently available in the world.

The continuous reaction system is based on excess Hydrogen recycled through the plant. The raw feed is introduced to the recycling Hydrogen stream. After passing across the catalyst excess Hydrogen is separated from the product oil within the reactor. It is removed from the reactor then water quenched to capture salts and light hydrocarbons. After water quench it is passed through an ambient temperature caustic scrubber to remove hydrogen sulfide then chilled to to drop out water vapor and hydrocarbon mists, passed through a sub micron coalescer, then recompressed for feed back to the reactor.

In the reactor small amounts of light alkanes can form through hydrogenation of the oil. This appears as methane, ethane and possibly some heavier alkanes in decreasing concentration with increasing molecular weight. Heavier hydrocarbon fractions are captured in the product oil. The buildup of these compounds in the recycle hydrogen needs to be controlled to maintain the partial pressures required for proper performance of the process. Control is achieved by purging a portion of the Hydrogen recycle gas after the sub micron coalescer. The purge is made up primarily of Hydrogen and is passed to a catalytic oxidizer operating at between, primarily to convert Hydrogen to water prior to air emission.

There are several critical features of the oxidizer emission. These include:

a. The feed to the scrubber is intermittent only and represents only some 0.4% of the process mass flow, that is, 99.6% of the process mass flow occurs in a closed to atmosphere loop.

b. The feed to the catalyst consists of greater than 90% by volume (80% by mass) Hydrogen. The process is to all intents and purposes closed loop with respect to the chemical or oil feed.

c. The oxidizer is based on a platinum catalyst designed for low temperature oxidation of Hydrogen and light alkanes in air; there are no combustion reactions involved.

d. The feed to the oxidizer is water quenched then caustic scrubbed then chilled and then filtered before it reaches the catalyst meaning slippage to the oxidizer of any chlorine, substituted hydrocarbons and any C6 or heavier hydrocarbons essentially cannot occur.

The air emissions have been tested both at Pilot scale by CSIRO and at a commercial scale by Hydrodec. The CSIRO testing showed emissions within the requirement of NSW emission standards. Hydrodec independent testing, performed while processing non scheduled PCB contaminated oil (approximately 40 ppm PCB) showed results in compliance with emission standards. The more comprehensive tests were those carried out by Hydrodec. Results reported were at the limit of detection for the methods specified and were within the error bounds of a zero result. A result is reported in accordance with WHO and NATO analytical reporting guidelines that require reporting at the detection limits where a non-detect result is achieved. The analytical results combined with the extremely low mass flow rates for the emission combine to demonstrate, to all practical intents and purposes, a zero emission from the process. The results (as presented to DEC NSW) are provided in Appendix A.

SECTION 4 – PROCESS OPERATIONS TEST

This demonstration test will use contaminated transformer oil and capacitor oil provided by a yet to be named vendor. It is currently anticipated that sufficient oil will be available to conduct two runs.

The plant will be started, using normal operating conditions, on clean feed oil and stabilized before being switched to trial feedstock. At commencement of each stage, the pre-prepared feedstock will be introduced to the plant which will then be run for approximately 12 hours at constant conditions. Sampling will occur during each run as described in Section 5 below. After each run the plant will be switched to non-pcb feedstock. After 12 hours, the next PCB feedstock will be introduced for sampling. Two runs of PCB feedstock in total will completed.

Hydrodec will create test feedstock by combining PCB oil of greater than 1500 ppm PCB oil with non-pcb oil in process oil tank F-3. The F-3 tank will be used to feed the reactor through the FO-05 tank. Treated oil will then be collect in the Q and C tanks for additional sampling.

Caustic from Caustic scrubbers was not changed during the runs.

TABLE 4.1

PARAMETER	TEST 1	TEST 2
PCB Oil Concentration (P-1)(ppm)	1,500	1,500
PCB Oil Quantity (gallons	1,200	2000
Feedstock Quantity (gallons)	10,800	10,000
PCB Oil Quantity (F-3)	12,000	12,000
PCB Oil Concentration (F-3)(ppm)	150	250
Final PCB Concentration (ppm)	Non-detect	Non-detect
Treated Oil Quantity (gallons)	12,000	12,000

SECTION 5 – SAMPLING AND MONITORING PLAN

5.1 SAMPLING

The proposed sampling for the demonstration test consists of the following two materials:

- Initial feedstock PCB oil
- Treated Oil
- Waste water

Based on data obtained from the Young, AU facility, Hydrodec does not anticipate collecting air monitoring as part of this demonstration test.

5.1.1 Oil Samples

Initial PCB oil samples from each run of oil will be taken by collecting a sample of feedstock oil from the F-3 and FO-05 Tanks. A sample of untreated oil will then be taken from the FO-05 sample port each hour of a 12-hour run. Samples of treated oil will be taken from the reactor sample port each hour of the 12-hour run. In addition, one QA field duplicate sample will be taken for each test run (runs 1 and 2).

A total of 28 samples will be taken during each run of feedstock (F-3 and FO-05 initial, 12-FO-05 during run, 12 Reactor Sample port during run, 1 QA sample from the reactor sample port, 1 Final bulk sample from the Q or C tanks).

SAMPLE TYPE	TEST 1	Flush	TEST 2	Total # Samples
PCB Oil	14	14	14	42
Treated Oil (reactor)	12	12	12	36
QA Field Duplicate	1	1	1	3
Bulk Sample (Q or C Tanks)	1	1	1	3
Total Number of Samples	28	28	28	84

5.2 MONITORING

The following process parameters to be monitored will include but not be limited to: demonstration test:

- Tank Levels
- Flows
- Scavenger Levels
- Hydrogen Level
- Heater Temperature
- Process Pressure
- Water Flow

SECTION 6 – SAMPLING/ANALYSIS PROCEDURES

6.1 SAMPLING PROCEDURES

The samples described in Section 5.0 will be taken in accordance with EPA methodology for representative sampling. The QAPP provides a detailed discussion on the sampling procedures for the Hydrodec process.

6.1.1 Process samples

The sampling procedures for the Demonstration Test are summarized in the following table:

TABLE 6-1
Summary of Sampling Procedures

Analyte	Method	Matrix	Sample Volume	Holding time	Preservation
PCBs	ASTM 4059	Oil	4 oz. plastic (Nalgene)	7 days	N/A

PCB oil will be sampled directly from feedstock tank FO-05 prior to being fed into the process. Samples of the treated oil will be taken from the reactor sampling port.

Samples will be collected directly into 4 oz. Nalgene containers. Chain-of-custody forms will be established and will act as the transmittal form from the sampling personnel to the laboratory personnel. Samples will be manually transported to the laboratory in sample coolers.

6.2 ANALYSIS PROCEDURES

The analysis of the PCB in the PCB oil and in the treated oil will be conducted in accordance with EPA guidance. The QAPP (Appendix B) provides a detailed discussion on the sample analysis procedures. Test America, located in North Canton, Ohio has been selected to perform the laboratory analysis. The on-site Hydrodec lab will be used for operational evaluation.

SECTION 7 – MONITORING PROCEDURES

As stated in section The following process parameters to be monitored will include but not be limited to:

- Tank Levels
- Flows
- Scavenger Levels
- Hydrogen Level
- Heater Temperature
- Process Pressure
- Water Levels

All monitoring data will be recorded on Hydrodec daily monitoring logs which are completed approximately hourly during all Hydrodec oil processing activities. A copy of this log is provided in Appendix C.

SECTION 8 – DATA REPORTING

Throughout the demonstration test, recordkeeping will be performed documenting the operation of the equipment, including specific waste feed and process parameters, inspection maintenance activities, waste disposal, and decontamination procedures. Tables 8-1 and 8-2 provide examples of the checklists and recordkeeping forms.

In addition, a data summary sheet will be prepared for each test run. This summary sheet will be used to present the key data in the Demonstration Test Report. An example of the data summary sheet is given in Table 8-3.

TABLE 8-1

PRE-START UP CHECKLIST

ACTIVITY	COMPLETED	INITIALS	DATE
Confirm appropriate PPE & Safety equipment is in place.			
Test oil quantities are availbe and in place.			
Secondary containment is free of liquids and make repairs if necessary.			
Confirm control panel operations			
Confirm all monitoring equipment is functioning			
Test alarms			
Demo test training is completed and documented			

TABLE 8-2

START UP AND OPERATIONS CHECKLIST

ACTIVITY	COMPLETED	INITIALS	DATE/TIME
Visually monitor pumps and tanks during PCB oil transfer process			
Confirm no leakage during transfer			
Initiate process operation			
Check for leaks			
Initiate completion of shift monitoring logs			

TABLE 8-3

DEMONSTRATION TEST DATA SUMMARY SHEET

	TEST 1	Flush	TEST 2
DATE			
TIME TEST BEGUN			
TIME TEST ENDED			
OPERATING PARAMETERS			
PCB oil Quantity			
Average Reactor Temp			
Average Reactor Pressure			
SAMPLING AND ANALYSIS RESULTS			
PCB oil concentration			
Final PCB concentration of treated oil			
PCB concentration of waste water (ppm)			

SECTION 9 – MISCELLANEOUS TESTS

All the monitoring devices described in Section 7 will be inspected and/or tested prior to the initiation of the demonstration test. In addition, the safety equipment will be inspected and/or tested prior to the start of the demonstration test.

SECTION 10 - WASTE HANDLING AND DISPOSAL

Two waste streams will be generated as a result of this test and include wastewater and miscellaneous debris including sample gloves, wipes, etc. Both of these waste streams will be sampled and analyzed prior to offsite shipment for pre-treatment and disposal as applicable.

SECTION 11 - TEST SCHEDULE

Table 11-1 provides the proposed schedule for the demonstration test.

TABLE 11-1 SCHEDULE

ACTIVITY	SCHEDULE
PCB oil Sampling and transfer	Tuesday
Equipment check	Tuesday
Kickoff meeting	Wednesday
Pre-start-up checklist	Wednesday
Start-up Checklist	Wednesday
Initiate Sampling – Test 1	Wednesday
Conduct Test 1	Wednesday
Debrief and initiate flush	Wednesday
Complete flush	Thursday
Kickoff Meeting	Thursday
Start-up checklist	Thursday
Sampling – Test 2	Thursday
Conduct Test 2	Thursday
Debrief and initiate flush	Thursday
Kickoff/Debrief Meeting	Friday
Contingency Day	Friday

Hydrodec North America, LLC
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May 5, 2009

Mr. Matt Hale
Director - Office of Resource Conservation and Recovery
U.S. EPA - Mail Code 5301P
Potomac Yards North
2733 S. Crystal Drive
Rm # N-6331
Arlington, VA 22202

SUBJECT: Demonstration Test Plan: PCB Disposal by Non-Thermal Methods, Hydrodec North America, LLC.

Dear Director Hale,

Enclosed are two copies of the subject Demonstration Test Plan. The Demonstration Test Quality Assurance Project Plan (QAPP), which is Appendix B of this document, has yet to be completed. This along with any other proposed revisions will be developed and submitted under separate cover. Please process the Demonstration Test plan as warranted.

Hydrodec looks forward to working with your staff on this project and approval. I can be contacted at 330-454-8202 if you have any questions or concerns.

Sincerely,

Brian D. Klink
EHS&Q Manager
Hydrodec North America, LLC

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APPENDIX A

HISTORIC TEST DATA

Hydrodec Australia Pty Ltd
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Australia
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www.hydrodec.com

Department of Environment & Climate Change NSW
PO BOX 622
Queanbeyan NSW 2620

14th January 2009

Attention: Mr. David Winfield
Head of Operations Unit South East Region

Re: - Hydrodec Hydrogenation Technology Application: - Treatment of Scheduled Polychlorinated Biphenyls Contaminated Waste

Dear Sir

We write in response to your letter of 28 July 2008 and in accordance with special conditions contained in our POEO Act Licence number 11385 to present;

a. The results of repeat trials of the Hydrodec process when treating Scheduled PCB contaminated oil, and
b. The results for VOC monitoring and proof of performance data for the 20,000 litre per day plant when treating non Scheduled used transformer oils.

Based on the results of the Scheduled waste re-test, and the test data for the 20,000 litre per day plant we seek amendment of out POEO Act Licence to

a. Permit treatment of concentrated PCB in oil at our Young facility, and
b. Amend the Licence conditions for monitoring both the smaller and larger hydrogenation plants at the site.

Licence variation forms are attached along with a brief report of the trial program. We remain of the view that this trial has established the Hydrodec process as the world's most efficient, safest and lowest emission treatment process for persistent organic pollutants. We will be seeking further trials of other scheduled waste chemicals in the medium future.

Yours Faithfully
Hydrodec Australia

Mark McNamara
Chief Executive Officer

REPORT TO DECC NSW JANUARY 2009

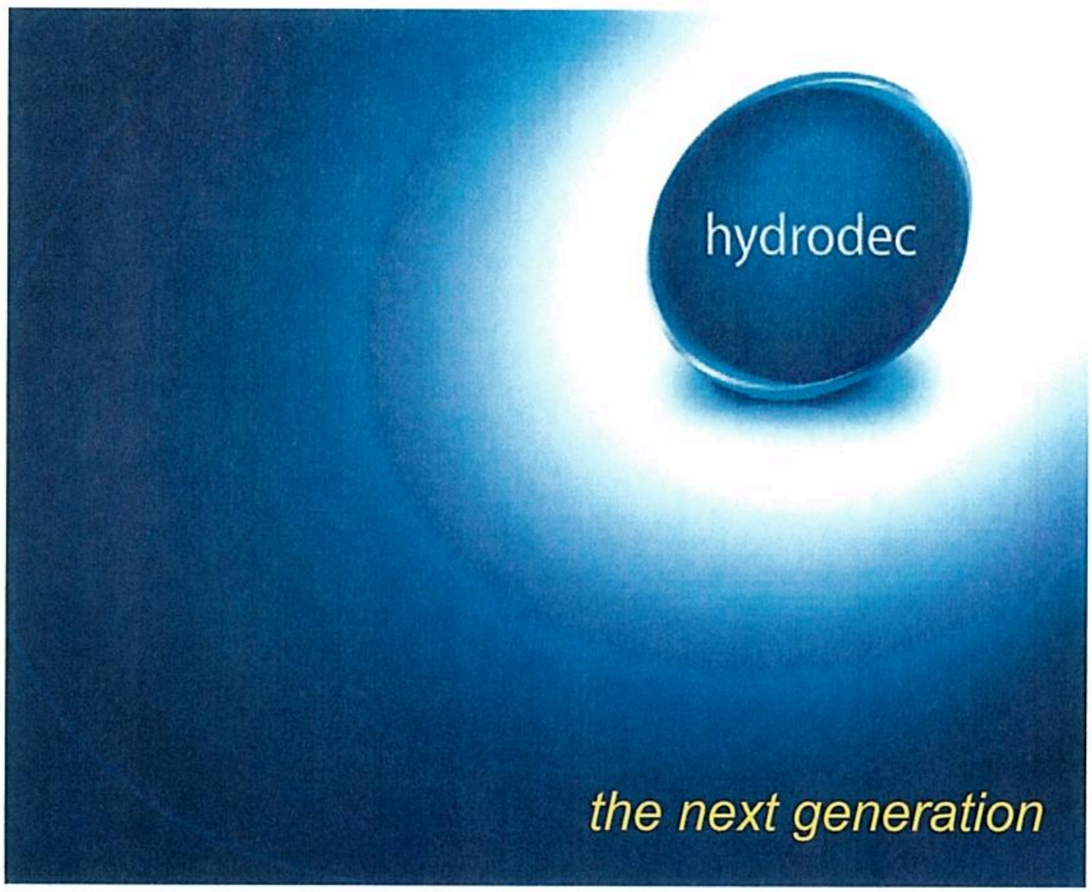
SCHEDULE X WASTE TREATMENT DEMONSTRATION AND 20,000 LITRE PER DAY PLANT MONITORING CONDITIONS

HYDRODEC TECHNOLOGY PERFORMANCE TRIALS (RE-TEST)

LICENCE VARIATION

HYDRODEC AUSTRALIA PTY LTD

POEO ACT LICENCE No.11385



Hydrodec Australia Pty Ltd
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Young NSW 2597
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1 Background

In mid 2008 Hydrodec Australia completed demonstration trials of the Hydrodec technology when treating PCB in transformer oil at Scheduled waste concentrations. The trials returned low level results for Furan in oil that caused EPA to seek verification that the Furans had not arisen out of the treatment process. EPA requested re-running of two stages of the original trial with additional testing to confirm that the Furans were not a by-product of the Hydrodec process. This brief report contains the results of the re-testing.

In parallel with the high concentration PCB trials, Hydrodec also carried out process monitoring for the purpose of establishing amended POEO Act Licence monitoring conditions for the 20,000 litre per day plant at the Young site.

This report should be read in conjunction with the original trial report dated June 2008.

2 Trial Procedures – RS1 (2,000 litre per day) Plant

As in the original trials, the plant was started, using normal operating conditions, on clean feed oil and stabilised before being switched to trial feedstock. At commencement of each stage, the pre-prepared feedstock was introduced to the plant which was then run for approximately 8 to 16 hours at constant conditions before sampling occurred. After each sampling event the plant was switched to the next feedstock and restabilised for sampling. Two runs in total were completed in accordance with the POEO Act special licence conditions.

Caustic from Caustic scrubbers was not changed during the runs.

Sampling and testing was carried out in accordance with Licence requirements using NATA certified procedures to the maximum extent possible under the test regime required.

PCB concentrations for the original trials and this re-test, the sample collection points and the tests carried out are summarised in Table 1. The re-test results are highlighted in green.

Table 1: Trial Conditions.

Stage Number	PCB Concentration (mg/kg)	Sample Location	Test Parameter
1	Non detectable	1. Recycle Gas Stream at Purge Point 2. Caustic Scrubbers 3. Product Oil	PCB, Dioxin/Furan, H_2S, VOC, VOC speciated Caustic Strength PCB, Dioxin/Furan, Oil resistivity
1 (Repeat)	Not Detectable	1. Recycle Gas Stream at Purge Point 2. Caustic Scrubbers 3. Product Oil	PCB, Dioxin/Furan, H_2S, VOC, VOC speciated Caustic Strength PCB, Dioxin/Furan, Oil resistivity
2	17	1. Recycle Gas Stream at Purge Point 2. Caustic Scrubbers 3. Product Oil	PCB, Dioxin/Furan, H_2S, VOC, VOC speciated Caustic Strength PCB, Dioxin/Furan, Oil resistivity
3	537	1. Recycle Gas Stream at Purge Point 2. Caustic Scrubbers 3. Product Oil	PCB, Dioxin/Furan, H_2S, VOC, VOC speciated Caustic Strength PCB, Dioxin/Furan, Oil reisitivity
4	4690	1. Recycle Gas Stream at Purge Point 2. Caustic Scrubbers 3. Product Oil	PCB, Dioxin/Furan, H_2S, VOC, VOC speciated Caustic Strength PCB, Dioxin/Furan, Oil resistivity
4 (Repeat)	4855	1. Recycle Gas Stream at Purge Point 2. Caustic Scrubber 3. Product Oil	PCB, Dioxin/Furan, H_2S, VOC, VOC speciated Caustic Strength PCB, Dioxin/Furan, Oil resistivity

3 Trial Results – RS1 (2,000 litre per day) Plant

Results for the original trials and the re-test are summarised in tables 2, 3 and 4. Full analytical reports for the re-test are attached in appendices 2, 3 and 4. Results have been tabulated as sample location and parameter versus PCB concentration in feedstock in order to identify any obvious trends in the data.

Table 2: PCB Destruction Effectiveness Measured as PCB in the Product Oil

Feedstock Oil		**Product Oil**		
PCB Conc (mg/kg)	**Dioxin/Furan – Middle Bound** (pg/g)	**Dioxin/Furan – Middle Bound** (pg/g)	**PCB Conc** (mg/kg)	**Resistivity** (Gigaohm/m)
<2	Not Tested	1.0	Below Detection	555.1
<2 (Repeat)	9.1	1.1	Below Detection	742.4
17	Not Tested	0.86	Below Detection	795.6
537	Not Tested	0.98	Below Detection	63.9
4690	Not Tested	0.95	Below Detection	2.1
4855 (Repeat)	240	1.3	Below Detection	525.2

Table 3: Recycle Gas Parameters as indicators of emission problems

	Recycle Gas	Parameters			
PCB Conc (mg/kg)	**Dioxin/Furan** Middle Bound (g/m^3)	**PCB** (g/m^3)	**H_2S** (g/m^3)	**VOC** (Chlorinated) (g/m^3)	**VOC** (Speciated) (g/m^3)
<2	9.7E-12	Below Detection	Below Detection	Below Detection	Below Detection
<2 (Repeat)	3.7E-12	Below Detection	7.8E-5	Below Detection	Trace (Refer Appendix 2)
17	2.7E-12	Below Detection	Below Detection	Below Detection	Below Detection
537	9.8E-12	Below Detection	Below Detection	Below Detection	Below Detection
4690	9.4E-12	Below Detection	Below Detection	Below Detection	Detected Refer Appendix 2a
4855 (Repeat)	3.9E-12	Below Detection	Below Detection	Below Detection	Trace (Refer Appendix 2)

Table 4: Caustic Scrubber Monitoring Data

Trial Stage	Caustic Strength (% Caustic)
1	Day 1 - 13.4% Day 2 – 8.9%
1 (Repeat)	Day 1 - 12% Day 2 – 12%
2	Day 2 – 8.9% Day 3 – 5.3% (Caustic changed)
3	Day 3 – 13.2% Day 4 – 7.4%
4	Day 4 – 7.4% Day 5 – 5.1% Day 6 – 3.8%
4 (Repeat)	Day 1 - 11% Day 2 – 11%

4 Trial Procedures and Results – RS2 (20,000 litre per day) Plant

The 20,000 litre per day plant was sampled during normal operation meaning that no special start up or run conditions were required. The results of testing on this plant are described in tables 5, 6 and 7.

Table 5: PCB, Dioxin and Furan in Oil

Feedstock Oil		Product Oil		
PCB Conc (mg/kg)	Dioxin/Furan – Middle Bound (pg/g)	Dioxin/Furan – Middle Bound (pg/g)	PCB Conc (mg/kg)	Resistivity (Gigaohm/m)
<2	5.7	0.86	Below Detection	610.2

Table 6: Recycle Gas parameters

	Recycle Gas Parameters				
PCB Conc (mg/kg)	**Dioxin/Furan** Middle Bound (g/m^3)	**PCB** (g/m^3)	**H_2S** (g/m^3)	**VOC** (Chlorinated) (g/m^3)	**VOC** (Speciated) (g/m^3)
<2	2.9E-12	Below Detection	0.0079	Below Detection	Trace (Refer Appendix 2)

Table 7: Caustic Scrubber Monitoring

Trial Stage	Caustic Strength (% Caustic)
1	Day 1 – 6%

5 Discussion

Destruction Effectiveness

Complete destruction of PCB was again confirmed in the repeat trials.

By Product Formation

The trace levels of furans that register in the congener assessment carried out as part of a full Dioxin analysis were again recorded in the repeat trials, and once again, at similar concentrations to those identified in the original trial runs. The results are a repeat of the original trials. Again, Dioxin data reported after treatment were within acceptable regulatory bounds.

These results were also confirmed in the 20,000 litre per day plant.

Dioxin/Furan

As required under the special Licence conditions the Dioxin/Furan concentrations in the repeat trial were also measured in the feed oil. The results of these analyses are significant. The feed oil with less than detectable PCB contained traces of Dioxin and Furan. The feed oil spiked with Askarel fluids to create a 5,000mg/kg PCB feed contained significant levels of Dioxin and Furan. The Dioxin and Furan identified in the feed oil was treated along with the high level PCB. Furans were not produced in the process.

VOC – Speciated

Speciated VOC results were a repeat of the original trials, confirming the conclusions from the original report. In addition to the conclusions from the original report appendix 5 contains the results from quarterly emission monitoring of RS2 (20,000 litres per day) plant oxidiser as per requirements of licence 11385. This monitoring overlapped the trial conditions to monitor the recycle gas composition of RS2 (20,000 litres per day) plant. Results show before and after levels of speciated VOC's and confirm the efficiency of the oxidiser.

Resistivity

In the repeat trial high resistivity was measured in the product oil regardless of feed oil PCB concentration. We believe our conclusion from the original trial however remains and that is, the resistivity of product oil immediately out of the plant is not a reliable indicator of process stability with the Hydrodec process operating in PCB destruction mode rather than refining more.

Future Monitoring

The primary reason for this repeat high concentration trial in the smaller plant was to consider any potential for there to be a link between the process and trace non toxic Furan identified in product oil and recycle gas in the original trial.

The data from the repeat trial clearly demonstrates that the Hydrodec process not only completely treats the PCB contained in the oil but also treats other hazardous Dioxin and Furan related chemicals associated with transformer oils and PCB.

From a process engineering point of view, the trial has established that under normal operating conditions complete destruction of PCB occurs without hazardous by products or emissions.

Consistent with the initial trials, the risk of hazardous emissions or hazardous by-product formation therefore primarily arises out of departures from normal operating conditions. Key operating conditions are reactor catalyst activity, reactor temperature, system pressure, hydrogen concentration in the recycle loop, and hydrogen (recycle) loop mass flow. Catalyst activity and overall process performance, based on this trial can be validated on a constant QA basis simply by monitoring PCB in the product oil as this is the primary export vector from the process.

There is no significant export vector to air or water. However, secondary monitoring of process stability can be achieved by monitoring the recycle gas stream.

There appears to be little value in monitoring VOC in the recycle gas as there are no constant VOC's to monitor and track. As a constant QA measure Hydrogen concentration and recycle gas mass flow are relevant constant indicators of process stability.

Annual verification of Dioxin/Furan concentrations in product oil and recycle gas would also be a reasonable statutory monitoring measure.

Other implications of these results

The Dioxin test data for the feed oils for all trials described in this report were surprising. The data strongly indicates that transformer oil and in particular PCB contaminated transformer oil represents a potentially significant source of Dioxin contamination in the environment. Logically therefore management and disposal of any transformer oil carries with it the risk of Dioxin contamination and therefore also dioxin dispersal to the wider environment. We are aware that lower level PCB contaminated transformer oil is regularly used across Australia as a fuel oil substitute. In light of the results of these trials any burning of transformer oil with any detectable level of PCB represents a potentially significant hazard that can be avoided.

The feed oil data suggests that other technologies approved for PCB contaminated transformer oil treatment should also be assessed for their ability to limit by-product formation, as with the Hydrodec process, and additionally be confirmed for their ability to treat Dioxin and associated hazards shown by these trials to be contained in PCB contaminated transformer oils.

The Stockholm Convention to which Australia is a signatory requires regulation and control of such materials and the data from feedstock testing in this report suggests that used transformer oil should potentially be considered a "Stockholm Convention" relevant material.

6 Conclusions and Recommendations

The Hydrodec process has confirmed it is an effective and safe treatment system for destruction of PCB's at up to 5,000 mg/kg PCB concentration in oil. It has also demonstrated a key ability to also treat trace Dioxin and related chemicals associated with oil and PCB chemicals. Highly concentrated PCB materials can readily be treated by dissolving the PCB in mineral oil for feed to the Hydrodec plant at concentrations in oil up to 5,000 mg/kg. Operating under normal conditions the Hydrodec process will treat PCB's without measurable air emissions, without by-product waste streams and without formation of any detectable hazardous Dioxin or Dioxin congeners in any by product stream.

The re-test has confirmed that there is no causal relationship between the treatment process and the trace non toxic Furan species identified in the product oil of the original trial. In fact the repeat runs clearly show the process to be an effective Dioxin and Furan treatment system at significant concentrations of Dioxin in the feed oil.

The small Hydrodec facility at the Hydrodec's Young site can immediately be licensed for treatment of Scheduled concentrations of PCB in oil and should be considered for Licensing to treat other organochlorine chemicals.

For the 2,000 litre per day plant treating scheduled waste concentrations of PCB in oil, the recommended primary monitoring for inclusion in licence conditions are:

For process monitoring and record keeping.

1. Testing of product oil for the presence of PCB from the process at the minimum rate of one sample per 2,000 litres treated.
2. Monitoring of Reactor temperature and pressure with temperature to be maintained between 300°C and 330°C, and pressure between 3,300kPa and 3,500kPa.
3. Monitoring of Hydrogen concentration in the gas recycle loop with Hydrogen concentration being maintained at a minimum of 90% v/v.
4. Monitoring of the gas recycle flow rate by pump stroke count to maintain the recycle mass flow at a minimum 90% of design.

For Licence Reporting

5. Annual measurement/verification of Dioxin/Furan in product oil and recycle gas stream with reporting to DECC.

For the 20,000 litre per day plant treating non-scheduled concentrations of PCB contaminated transformer oil the same monitoring conditions apply with the primary difference being that at this time the 20,000 litre per day plant is not proposed for the treatment of Scheduled concentrations of PCB in oil. The recommended primary monitoring for inclusion in the Licence conditions are identical to those recommended for the 2,000 litre per day plant with the exception that testing for the presence of PCB in the product be amended to once per 20,000 litres treated.

APPENDIX B

QA PLAN
(to be developed)

APPENDIX C

DAILY MONITORING LOG

HYDRODEC NORTH AMERICA
RS3 Hourly Day Shift Log

Date ____________________

Operator's ____________________

Tag No	Description	Units	6:30:am		8:30am		10:30am		12:30pm		2:30pm		4:30pm	
	COMPUTER SCREEN													
PT-05	Hydrogen Incoming Pressure	Kpa												
	TRAIN A													
TIC-A01	Average Reactor Temperature Train A	0°C												
TIC-A02	Charge Heater HT-A001 Sheath Temperature	0°C												
FT-A27	PU-A001 Scavenger pump flow	L/Hr												
FIT-A26	Charge pump flow rate	L/Hr												
FIT-A11	Recycled gas & Hydrogen flow rate	L/Hr												
CO-A001	Recycled gas compressor running	Y/N												
PIT-A11	Gas Accumulator VE-001 Pressure	Kpa												
PT-A02	Incoming Oil pressure	Kpa												
PT-A03A	Pressure after HT-A001	Kpa												
PDA-A03	Pressure between HT-A001and RA-A001	Kpa												
PT-A03B	Pressure after RA-A001	Kpa												
LIC-A01	RA-A001 Oil Level	%												
TT-A05A	Reactor RA-A001 Top Bed Temperature Right	0°C												
TT-A05C	Reactor RA-A001 Bottom Temperature	0°C												
DPT-A01	Filter A/B-A001 pressure Differential	Kpa												
PU-A004	Quench Water pump running	Y/N												
	TRAIN B													
TIC-B01	Average Reactor Temperature Train B	0°C												
TIC-B02	Charge Heater HT-B001 Sheath Temperature	0°C												
FT-B27	PU-B001 Scavenger pump flow	L/Hr												
FIT-B26	Charge pump flow rate	L/Hr												
FIT-B11	Recycled gas & Hydrogen flow rate	L/Hr												
CO-B001	Recycled gas compressor running	Y/N												
PIT-B11	Gas Accumulator VE-B001 Pressure	Kpa												
PT-B02	Incoming Oil pressure	Kpa												
PT-B03A	Pressure after HT-B001	Kpa												
PDA-B03	Pressure between HT-B001and RA-B001	Kpa												
PT-B03B	Pressure after RA-B001	Kpa												
LIC-B01	RA-B001 Oil Level	%												
TT-B05A	Reactor RA-B001 Top Bed Temperature Right	0°C												
TT-B05C	Reactor RA-B001 Bottom Temperature	0°C												
DPT-B01	Filter A/B-B001 pressure Differential	Kpa												
PU-B004	Quench Water pump running	Y/N												

HYDRODEC NORTH AMERICA
RS3 Hourly Day Shift Log

Tag No	Description	Units	6:30am		8:30am		10:30am		12:30pm		2:30pm		4:30pm	
	COMPUTER SCREEN													
	TRAIN C													
TIC-C01	Average Reactor Temperature Train C	0°C												
TIC-C02	Charge Heater HT-C001 Sheath Temperature	0°C												
FT-C27	PU-C001 Scavenger pump flow	L/Hr												
FIT-C26	Charge pump flow rate	L/Hr												
FIT-C11	Recycled gas & Hydrogen flow rate	L/Hr												
CO-C001	Recycled gas compressor running	Y/N												
PIT-C11	Gas Accumulator VE-C001 Pressure	Kpa												
PT-C02	Incoming Oil pressure	Kpa												
PT-C03A	Pressure after HT-C001	Kpa												
PDA-C03	Pressure between HT-C001and RA-C001	Kpa												
PT-C03B	Pressure after RA-C001	Kpa												
LIC-C01	RA-C001 Oil Level	%												
TT-C05A	Reactor RA-C001 Top Bed Temperature Right	0°C												
TT-C05C	Reactor RA-C001 Bottom Temperature	0°C												
DPT-C01	Filter A/B-C001 pressure Differential	Kpa												
PU-C004	Quench Water pump running	Y/N												
	TRAIN D													
TIC-D01	Average Reactor Temperature Train D	0°C												
TIC-D02	Charge Heater HT-D001 Sheath Temperature	0°C												
FT-D27	PU-D001 Scavenger pump flow	L/Hr												
FIT-D26	Charge pump flow rate	L/Hr												
FIT-D11	Recycled gas & Hydrogen flow rate	L/Hr												
CO-D001	Recycled gas compressor running	Y/N												
PIT-D11	Gas Accumulator VE-D001 Pressure	Kpa												
PT-D02	Incoming Oil pressure	Kpa												
PT-D03A	Pressure after HT-D001	Kpa												
PDA-D03	Pressure between HT-D001and RA-D001	Kpa												
PT-D03B	Pressure after RA-D001	Kpa												
LIC-D01	RA-D001 Oil Level	%												
TT-D05A	Reactor RA-D001 Top Bed Temperature Right	0°C												
TT-D05C	Reactor RA-D001 Bottom Temperature	0°C												
DPT-D01	Filter A/B-D001 pressure Differential	Kpa												
PU-D004	Quench Water pump running	Y/N												

HYDRODEC NORTH AMERICA
RS3 Hourly Day Shift Log

Tag No	Description	Units	6:30am		8:30am		10:30am		12:30pm		2:30pm		4:30pm	
	COMPUTER SCREEN													
	STAGE 2													
FIC-12	Purge gas Valve	%												
TT-12	Ve-002 HP Wash Separator Temperature	0°C												
LIC-11	HP Gas Separator VE-002 Level	%												
TT-18	Recycled gas temperature after HX-006	0°C												
PIC-13	System Pressure	Kpa												
LIC-12	Ve-003 Oil/Wash Seperator Level	%												
TT-16	Ve-003 Oil/Wash Seperator Temperature	0°C												
DPT-12	Differential Pressure Filter A/B 12	Kpa												
TT-15	Ve-004 HP Vent Seperator Temperature	0°C												
LIC-13	Ve-004 HP Vent Seperator Level	%												
DPT-13	Differential Pressure Filter A/B 13	kpa												
PT-24	LP Flash Drum VE-005 Kpa	Kpa												
LIC-25	LP Flash Drum VE-005 Level	%												
DPT-25	Differential Pressure Filter A/B 25	Kpa												
TT-23	Product Oil Temperature	0°C												
LIC-26	Ve-006 Waste Receiver Level	%												
PU-006	Waste oil/water pump running	Y/N												
LIC-27	Ve-011 Heavy phase tank level	%												
LIC-24	Ve-010 Light Phase tank level	%												
PU-005	Product Oil Pump Running	Y/N												
AT-22	RO Water Conductivity	u/S												
FIC-21	RO water Flow rate	L/hr												
PT-18	Sc-001A Scrubber Pressure	Kpa												
PT-19	Sc-001B Scrubber Pressure	Kpa												
LT-18	Sc-001A Scrubber level	%												
LT-19	Sc-001B Scrubber level	%												
PIT-31	Ve-008 Knock out Drum pressure	Kpa												
TT-33	RA-003 oxidizer Top Temperature	0°C												
TIC-34	RA-003 oxidiser average Temperature	0°C												
TIC-39	HT-002 Air Heater Temperature	0°C												

HYDRODEC NORTH AMERICA
RS3 Hourly Day Shift Log

Date ______________________ Operator's ______________________

Tag No	Description	Units	6:30 AM	7:30 AM	8:30 AM	9:30 AM	10:30 AM	11:30 AM	12:30 PM	1:30 PM	2:30 PM	3:30 PM	4:30 PM	5:30 PM
	OUTSIDE CHECKS													
	Glycol Chiller running	Y/N												
PI-21	Demin water pressure before flow meter	Kpa												
	Demin water pressure after meter	Kpa												
	Drain Ve-009 Catch Pot	FL OZ												
	Drain HX-006 Catch Pot	Liters												
	Drain HX-005 Catch Pot	Liters												
	Hydrogen Building													
	Hogen 1 Hydrogen Flow Rate	KGH												
	Hogen 2 Hydrogen Flow Rate	KGH												
	Hogen 3 Hydrogen Flow Rate	KGH												
	Hydrogen man pack bottle pressure	Bar												
	Cooling Tower tanks	%												
	RO System	ppm												
	RO Feed tank	%												
	Compressor	PSI												
	Sulfur bind running	Y/N												
	Waste water tanks	Gal												
	Check waste water totes on site	Y/N												
	Check Hydrodrys	Y/N												
	Check buckets for draings	Y/N												
	Scavenger readings													
	A	PPM												
	B	PPM												
	C	PPM												
	D	PPM												
	Caustic Tritrate													

Comments

HYDRODEC NORTH AMERICA
RS3 Hourly Night Shift Log

Date ______________________ Operator's ______________________

Tag No	Description	Units	6:30pm	[redacted]	8:30pm	[redacted]	10:30pm	[redacted]	12:30am	[redacted]	2:30am	[redacted]	4:30am	[redacted]
	COMPUTER SCREEN													
PT-05	Hydrogen Incoming Pressure	Kpa												
	TRAIN A													
TIC-A01	Average Reactor Temperature Train A	0°C												
TIC-A02	Charge Heater HT-A001 Sheath Temperature	0°C												
FT-A27	PU-A001 Scavenger pump flow	L/Hr												
FIT-A26	Charge pump flow rate	L/Hr												
FIT-A11	Recycled gas & Hydrogen flow rate	L/Hr												
CO-A001	Recycled gas compressor running	Y/N												
PIT-A11	Gas Accumulator VE-001 Pressure	Kpa												
PT-A02	Incoming Oil pressure	Kpa												
PT-A03A	Pressure after HT-A001	Kpa												
PDA-A03	Pressure between HT-A001and RA-A001	Kpa												
PT-A03B	Pressure after RA-A001	Kpa												
LIC-A01	RA-A001 Oil Level	%												
TT-A05A	Reactor RA-A001 Top Bed Temperature Right	0°C												
TT-A05C	Reactor RA-A001 Bottom Temperature	0°C												
DPT-A01	Filter A/B-A001 pressure Differential	Kpa												
PU-A004	Quench Water pump running	Y/N												
	TRAIN B													
TIC-B01	Average Reactor Temperature Train B	0°C												
TIC-B02	Charge Heater HT-B001 Sheath Temperature	0°C												
FT-B27	PU-B001 Scavenger pump flow	L/Hr												
FIT-B26	Charge pump flow rate	L/Hr												
FIT-B11	Recycled gas & Hydrogen flow rate	L/Hr												
CO-B001	Recycled gas compressor running	Y/N												
PIT-B11	Gas Accumulator VE-B001 Pressure	Kpa												
PT-B02	Incoming Oil pressure	Kpa												
PT-B03A	Pressure after HT-B001	Kpa												
PDA-B03	Pressure between HT-B001and RA-B001	Kpa												
PT-B03B	Pressure after RA-B001	Kpa												
LIC-B01	RA-B001 Oil Level	%												
TT-B05A	Reactor RA-B001 Top Bed Temperature Right	0°C												
TT-B05C	Reactor RA-B001 Bottom Temperature	0°C												
DPT-B01	Filter A/B-B001 pressure Differential	Kpa												
PU-B004	Quench Water pump running	Y/N												

HYDRODEC NORTH AMERICA
RS3 Hourly Night Shift Log

Tag No	Description	Units	6:30pm	[redacted]	8:30pm	[redacted]	10:30pm	[redacted]	12:30am	[redacted]	2:30am	[redacted]	4:30am	[redacted]
	COMPUTER SCREEN			[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
				[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
				[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
	TRAIN C			[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
TIC-C01	Average Reactor Temperature Train C	0°C		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
TIC-C02	Charge Heater HT-C001 Sheath Temperature	0°C		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
FT-C27	PU-C001 Scavenger pump flow	L/Hr		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
FIT-C26	Charge pump flow rate	L/Hr		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
FIT-C11	Recycled gas & Hydrogen flow rate	L/Hr		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
CO-C001	Recycled gas compressor running	Y/N		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PIT-C11	Gas Accumulator VE-C001 Pressure	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PT-C02	Incoming Oil pressure	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PT-C03A	Pressure after HT-C001	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PDA-C03	Pressure between HT-C001and RA-C001	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PT-C03B	Pressure after RA-C001	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
LIC-C01	RA-C001 Oil Level	%		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
TT-C05A	Reactor RA-C001 Top Bed Temperature Right	0°C		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
TT-C05C	Reactor RA-C001 Bottom Temperature	0°C		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
DPT-C01	Filter A/B-C001 pressure Differential	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PU-C004	Quench Water pump running	Y/N		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
				[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
				[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
	TRAIN D			[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
TIC-D01	Average Reactor Temperature Train D	0°C		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
TIC-D02	Charge Heater HT-D001 Sheath Temperature	0°C		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
FT-D27	PU-D001 Scavenger pump flow	L/Hr		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
FIT-D26	Charge pump flow rate	L/Hr		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
FIT-D11	Recycled gas & Hydrogen flow rate	L/Hr		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
CO-D001	Recycled gas compressor running	Y/N		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PIT-D11	Gas Accumulator VE-D001 Pressure	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PT-D02	Incoming Oil pressure	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PT-D03A	Pressure after HT-D001	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PDA-D03	Pressure between HT-D001and RA-D001	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PT-D03B	Pressure after RA-D001	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
LIC-D01	RA-D001 Oil Level	%		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
TT-D05A	Reactor RA-D001 Top Bed Temperature Right	0°C		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
TT-D05C	Reactor RA-D001 Bottom Temperature	0°C		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
DPT-D01	Filter A/B-D001 pressure Differential	Kpa		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]
PU-D004	Quench Water pump running	Y/N		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]

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RS3 Hourly Night Shift Log

Tag No	Description	Units	6:30pm		8:30pm		10:30pm		12:30am		2:30am		4:30am	
	COMPUTER SCREEN													
	STAGE 2													
FIC-12	Purge gas Valve	%												
TT-12	Ve-002 HP Wash Separator Temperature	0°C												
LIC-11	HP Gas Separator VE-002 Level	%												
TT-18	Recycled gas temperature after HX-006	0°C												
PIC-13	System Pressure	Kpa												
LIC-12	Ve-003 Oil/Wash Seperator Level	%												
TT-16	Ve-003 Oil/Wash Seperator Temperature	0°C												
DPT-12	Differential Pressure Filter A/B 12	Kpa												
TT-15	Ve-004 HP Vent Seperator Temperature	0°C												
LIC-13	Ve-004 HP Vent Seperator Level	%												
DPT-13	Differential Pressure Filter A/B 13	kpa												
PT-24	LP Flash Drum VE-005 Kpa	Kpa												
LIC-25	LP Flash Drum VE-005 Level	%												
DPT-25	Differential Pressure Filter A/B 25	Kpa												
TT-23	Product Oil Temperature	0°C												
LIC-26	Ve-006 Waste Receiver Level	%												
PU-006	Waste oil/water pump running	Y/N												
LIC-27	Ve-011 Heavy phase tank level	%												
LIC-24	Ve-010 Light Phase tank level	%												
PU-005	Product Oil Pump Running	Y/N												
AT-22	RO Water Conductivity	u/S												
FIC-21	RO water Flow rate	L/hr												
PT-18	Sc-001A Scrubber Pressure	Kpa												
PT-19	Sc-001B Scrubber Pressure	Kpa												
LT-18	Sc-001A Scrubber level	%												
LT-19	Sc-001B Scrubber level	%												
PIT-31	Ve-008 Knock out Drum pressure	Kpa												
TT-33	RA-003 oxidizer Top Temperature	0°C												
TIC-34	RA-003 oxidiser average Temperature	0°C												
TIC-39	HT-002 Air Heater Temperature	0°C												

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HYDRODEC NORTH AMERICA
RS3 Hourly Night Shift Log

Date ______________________ Operator's ______________________

Tag No	Description	Units	6:30PM	7:30PM	8:30PM	9:30PM	10:30PM	11:30PM	12:30AM	1:30AM	2:30AM	3:30AM	4:30AM	5:30AM
	OUTSIDE CHECKS													
	Drain Water Off Feed Oil Tank Inside													
	Glycol Chiller running	Y/N												
PI-21	Demin water pressure before flow meter	Kpa												
	Demin water pressure after meter	Kpa												
	Drain Ve-009 Catch Pot	FL OZ												
	Drain HX-006 Catch Pot	FL OZ												
	Drain HX-005 Catch Pot	FL OZ												
	Hydrogen Building													
	Hogen 1 Hydrogen flow rate	%												
	Hogen 2 Hydrogen flow rate	%												
	Hogen 3 Hydrogen flow rate	%												
	Check Tank Farms													
	Feed Oil Tank Farm													
	Clean Oil Tank Farm													
	Hydrogen man pack bottle pressure	Bar												
	Cooling Tower tanks	%												
	RO System	ppm												
	RO Feed tank	%												
	Compressor	PSI												
	Sulfur bind running	Y/N												
	Waste water tanks	Gal												
	Check waste water totes on site	Y/N												
	Check Hydrodrys	Y/N												
	Check buckets for draings	Y/N												
	Scavenger readings													
	A	PPM												
	B	PPM												
	C	PPM												
	D	PPM												
	Caustic Tritrate													